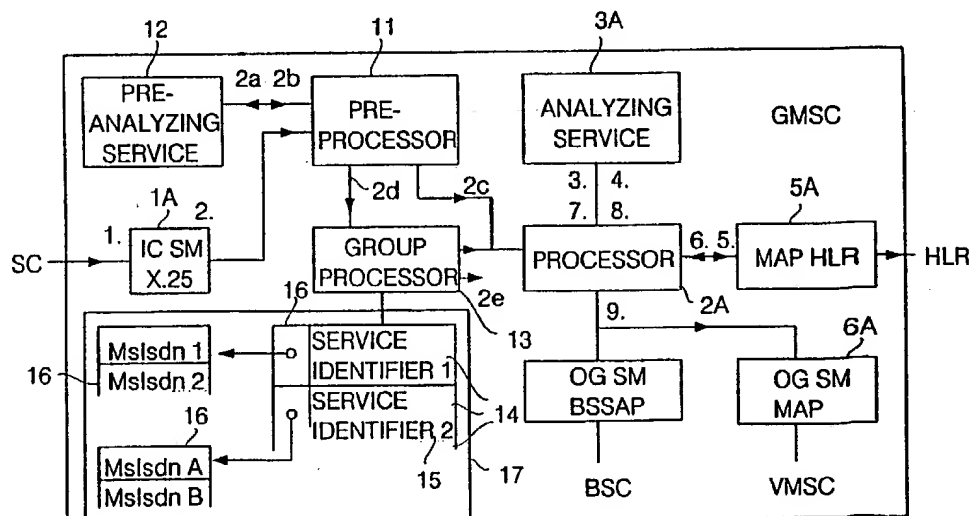




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(54) Title: METHOD FOR TRANSMITTING SHORT MESSAGES IN A RADIO SYSTEM



(57) Abstract

A method, mobile exchange and system for transmitting short messages in a cellular radio system, in which method a short message is received (1A) by a mobile exchange (GMSC) of a cellular radio system. In order that the short message transmitted by an A-subscriber through a short message service centre (SC) could be sent to several B-subscribers, the received short message is copied (13) to produce a plurality of essentially identical short messages, and each of the copied short messages is then sent (2A) to a separate recipient included in the group of subscribers.

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Method for transmitting short messages in a radio system

5 The invention concerns a method for transmitting short messages in a cellular radio system, in which method a short message is received by a mobile exchange of a cellular radio system.

10 The invention also concerns a mobile exchange for transmitting short messages in a cellular radio system, the mobile exchange comprising means for receiving an incoming short message, means for checking where the recipient of the short message is located, and means for forwarding the received short message to a subscriber.

15 In addition, the invention concerns a system for transmitting short messages, the system comprising a short message service centre forwarding short messages transmitted by an A-subscriber to a mobile exchange of a cellular radio network, the mobile exchange comprising
20 means for forwarding short messages.

 Various cellular radio or mobile telephone systems in which the geographical area covered by the system is divided into smaller separate radio areas or cells are today used or being developed. When a radio
25 telephone or mobile telephone resides in a cell, it communicates with the fixed network through a fixed radio station located in the cell. The mobile telephones belonging to the system are allowed to roam freely within the area of the system from one cell to another.
30 One of these systems is the digital mobile telephone system GSM (Global System for Mobile Communications).

 In cellular radio networks, it is known to transmit short messages through a short message service centre which is separate from the cellular radio network.
35 One of these systems transmitting and forwarding

short messages is described in Recommendation GSM 03.40, ETSI/PT, February 1992. It describes connection of a short message service centre to a mobile exchange of a cellular radio network, and operation of the short message service centre as it transmits and forwards short messages from outside the cellular radio network and from one subscriber (A-subscriber) of the cellular radio network to another subscriber (B-subscriber) of the network or to an entity outside the network that is capable of receiving and/or transmitting short messages. Recommendation GSM 04.11, ETSI/PT 12, February 1992 provides a closer description of transmission of short messages on the radio path between GSM terminal equipment, a mobile exchange and a short message service centre.

The above, implemented prior art solutions have emphasized transmission of short messages from an A-subscriber through a short message service centre to a B-subscriber. The problem with this kind of conventional transmission of short messages is that the A-subscriber cannot send the same short message to several B-subscribers simultaneously. If the A-subscriber wants to send the same short message to several B-subscribers, it has to send the same short message to each B-subscriber separately. This occupies the A-subscriber, and its terminal equipment is loaded heavily; the telecommunication system receiving the messages and the short message service centre connected thereto are also loaded heavily by the plurality of short messages, even though the messages are identical. Consequently, transmission of large numbers of short messages to a large number of B-subscribers is laborious and slow.

The object of the present invention is to make it possible for the A-subscriber to send the same short message to several B-subscribers without that the A-

subscriber has to send the short message from its own terminal equipment to each B-subscriber separately. The aim of the invention is thus to eliminate the above-described problem of transmission of short messages.

5 This new kind of method for transmitting short messages in a cellular radio system is characterised by checking whether the received short message is to be delivered to one subscriber or to a group of several subscribers; searching for the subscriber numbers of all
10 the subscribers of the group on the basis of the service identifier contained in the short message to be delivered to the group; copying said short message for each subscriber of the group; and sending the copied short messages to the subscribers.

15 The mobile exchange according to the invention for transmitting short messages in a cellular radio system is characterised in that the mobile exchange comprises means for analyzing the service identifier of the received short message to check whether the short
20 message is to be delivered to one subscriber or to a group of several subscribers, memory means for storing the addresses of the subscribers included in the subscriber groups corresponding to the service identifiers of the received short messages, means for reading from
25 the memory means the addresses of the subscribers of the group to which the short message is to be delivered on the basis of the service identifier contained in the short message, means for copying the short message directed to a group for each member of the group, and
30 means for forwarding each of these copied short messages to individual subscribers.

 The system of the invention for forwarding short messages is characterised in that the mobile exchange further comprises means for analyzing the service
35 identifier of the received short message to check

whether the short message is to be delivered to one subscriber or to a group of several subscribers, memory means for storing the addresses of the subscribers included in the subscriber groups corresponding to the service identifiers of the received short messages, means for reading from the memory means the addresses of the subscribers of the group to which the short message is to be delivered on the basis of the service identifier contained in the short message, means for copying the short message directed to a group for each member of the group, and means for forwarding each of these copied short messages to individual subscribers.

The basic idea of the invention is that groups of addresses of B-subscribers receiving the same short messages are stored in the memories of the mobile exchanges. When an A-subscriber wants to send the same short message to a defined group of B-subscribers, it sends the short message provided with the identifier of this group through a short message service centre or in some other way to a gateway MSC or to some other system forwarding short messages. This short messages forwarding system - e.g. a gateway MSC - copies the short message for each B-subscriber of the group selected, searches the memory for the address of each B-subscriber of the group concerned and sends a separate, yet identical, short message to each B-subscriber of the group.

The advantage of this kind of method, mobile exchange and system for transmitting short messages in a cellular radio system is that the A-subscriber can easily send the same short message to several B-subscribers without that the A-subscriber has to send the same short message to each B-subscriber separately. When a method like this is implemented, the load of the telecommunication link, typically an X.25 link, between the gateway MSC and the short message service centre SC or

some other entity capable of transmitting short messages is reduced to a fraction of what it was, as compared with the prior art method, in a situation where the A-subscriber transmits the same short message to several B-subscribers. In other words, it is possible to form groups of e.g. the employees of a firm and send the same short message to all members of the group.

In the following the invention will be described in greater detail with reference to the attached drawings, in which

Fig. 1 shows a schematic view of a cellular radio system in which the method and system according to the invention can be applied,

Fig. 2 shows a block diagram of a prior art mobile exchange operating as a gateway MSC,

Fig. 3 shows a frame structure of a short message according to the invention,

Fig. 4 shows a block diagram of a mobile exchange according to the invention operating as a gateway MSC, and

Fig. 5 shows a list of service numbers according to the invention and lists of subscribers belonging to the same groups.

In the following the method of the invention will be described in the digital mobile telephone system GSM, which is where the invention is primarily applied. However, the method of the invention can be applied in other similar radio systems or modifications of the GSM. The basic structure and operations of the GSM are well known to those skilled in the art, and they are defined fairly accurately in the specifications of the GSM, particularly in Recommendations GSM 01.02, 11.30, 11.31, 11.32 and 03.40.

The solution of Fig. 1, which is typical of the field in which the invention is applied, shows two MSC

areas, one with a mobile exchange MSC1 and a visitor location register VLR1 and the other with a mobile exchange MSC2 and a visitor location register VLR2. Each MSC area covers one or more traffic areas, and in each traffic area traffic is controlled by a base station controller (BSC), which controls several fixed radio stations or base transceiver stations (BTS). Each radio cell mentioned above has one base station BTS, and one base station controller BSC serves a plurality of cells. A mobile station MS roaming in a cell provides a two-way radio connection with the base station BTS of the cell concerned. The Fig. shows several MS subscribers having a mobile telephone or some other radio apparatus as terminal equipment. Any of the subscribers may be a B-subscriber BMS to which short messages are sent.

A GSM network is usually connected to other networks, such as a Public Switched Telephone Network (PSTN), a Public Land Mobile Network (PLMN), a Packet Switched Public Data Network (PSPDN) or an Integrated Services Digital Network (ISDN), through a defined MSC called a gateway MSC (GMSC). Through the GMSC, a short message service centre SC forwarding short messages from an A-subscriber to a B-subscriber may be connected to the mobile telephone network. Connection of a short message service centre SC to a cellular radio network is described in Annex 1 of Recommendation GSM 03.40 issued by ETSI. One or more (all) mobile exchanges of the network may act as a gateway MSC. Between the GMSC and any other MSC of the network can be provided a voice channel connection. The GMSC also has a signalling connection to a home location register HLR. The HLR in turn has a signalling connection to visitor location registers VLR. Alternatively, a centre of another telecommunication system, e.g. an ISDN centre, may act as a gateway MSC.

Fig. 2 shows an operational block diagram of a prior art MSC acting as a gateway MSC. The short message transmitted by the A-subscriber is stored for forwarding in a short message service centre SC, which transmits the short message to a gateway MSC. A conventional MSC may act as a GMSC. The incoming short message (IC SM) block 1A of the GMSC receives 1 a short message e.g. through an X.25 link well known by those skilled in the art and forwards 2 the message received to a short message processor 2A. The processor 2A communicates with 3 an analyzing service 3A, which checks the home location register HLR of the B-subscriber BMS to which the short message is to be delivered. The analyzing service 3A sends 4 the address of the home location register HLR of the B-subscriber BMS to the processor 2A. The processor 2A then commands 5 the mobile application part MAP 5A of the mobile exchange to send an inquiry SendRoutingInfoForSM concerning the routing information of the B-subscriber BMS to the home location register HLR. The home location register HLR of the B-subscriber responds by sending 6 the number of the MSC the area of which the B-subscriber is visiting (VMSC number) through the mobile application part MAP to the processor 2A. The processor 2A then communicates with the analyzing service 3A and requests 7 the analyzing service 3A to check what MSC the short message should be delivered to, i.e. whether the B-subscriber BMS is located within the gateway MSC in question, i.e. whether the GMSC is the same MSC in the MSC area of which the B-subscriber is located, or whether it is located in the area of some other mobile exchange VMSC. The analyzing service responds to the request by reporting 8 whether the B-subscriber BMS is within the area of the same GMSC or of some other mobile exchange VMSC, and to what mobile exchange the short message should be

routed. The processor 2A then makes a decision about whether to send the short message to a VMSC by sending an Outgoing Short Message 6A to the mobile application part (OG SM MAP), or to the base station BSC of its own MSC by sending an Outgoing Short Message BSSAP 7A to the signalling equipment, which forwards the short message to an MS located within the area of the same MSC.

In this prior art solution it must be noted that if the A-subscriber wants to send the same short message to several B-subscribers, it has to send the same short message provided with the address of each B-subscriber first to a short message service centre SC, which then forwards each of the short messages separately to the incoming short message block 1A of the mobile exchange acting as the gateway MSC, and the MSC then forwards each of the short messages separately to each receiving B-subscriber.

Fig. 4 shows an operational block diagram of an MSC according to the invention acting as a GMSC. A short message service centre SC is connected to an MSC acting as a GMSC. The SC sends to the GMSC a short message with a detailed structure as described in Fig. 3. This short message is defined in item 9.2.3.1. of Recommendation GSM 03.40. The short message comprises e.g. a TS-Originating-Address field OA, which defines the address of the originator. It is described in item 9.2.4.3. of Recommendation GSM 03.40 and contains the address of the short message service centre SC. In addition, the short message comprises a TS-Destination-Address field DA, which defines the address of the recipient. It is described in item 9.2.4.2. of Recommendation GSM 03.40 and - in the prior art solution - contains the address of the B-subscriber. In the solution according to the invention, the field containing the address of the recipient may include either the

address of the B-subscriber BMS or a short message service identifier 15. It is easy for a person skilled in the field of short messages to understand that in a short message the above-described fields may also be in another order and that between the fields concerned, other fields may exist.

The incoming short message IC SM block 1A of the gateway MSC receives a short message transmitted by the short message service centre SC and forwards the received short message to a short message preprocessor 11 connected to the block 1A. The preprocessor 11 communicates with a preanalyzing service 12, and the preprocessor 11 requests 2a the preanalyzing service 12 to check whether the short message is addressed to an individual B-subscriber or to a group of B-subscribers. The preanalyzing service 12 detects it from the address DA of the short message (Fig. 3) if the address DA includes the service number of a group of B-subscribers BMS, and informs 2a the preprocessor accordingly. Likewise, if the address included in the short message is that of a single B-subscriber BMS, the preanalyzing service 12 informs the preprocessor 11 accordingly. The preprocessor 11 processes the information received from the preanalyzing service 12, and if the short message is to be delivered to a single B-subscriber, the preprocessor 11 sends 2c the short message received from the incoming short message IC SM block 1A to the processor 2A, which forwards the short message to this one B-subscriber in the same manner as described in connection with the description of the prior art in Fig. 2 and the description thereof. If, on the other hand, the short message is addressed to a group of several B-subscribers, i.e. if the TS-Destination-Address field DA of the short message includes a short message service identifier 15, the pre-processor 11 sends 2d the short

message to a group processor 13, which communicates with the preprocessor 11. The group processor 13 reads the short message service identifier 15 from the TS-Destination-Address field DA of the short message. Fig. 5 shows a list 14 of service identifiers according to the invention, and to each service identifier 15 corresponds an identifier 16 of a corresponding group of B-subscribers. This list 14 and address lists LA, LB and LC of the subscribers corresponding to the service identifier 16 can be formed in a memory means 17 integrated in the MSC. Fig. 5 shows one possible memory hierarchy of this kind of memory means 17. Further, to this B-subscriber group identifier corresponds a list of addresses of the B-subscribers belonging to the group, i.e. a list of MSIsdn numbers; the list includes the addresses, or MSIsdn numbers, of all subscribers belonging to the group. In Fig. 5, for example, to a service identifier 16A corresponds a list LA of MSIsdn numbers of the B-subscribers; the MSIsdn numbers of the members of the group in the list being A1, A2, ..., AN. Correspondingly, to a service identifier 16C corresponds a list LC of addresses of the B-subscribers; the addresses of the members of this group LC being C1, C2, ..., CN. Likewise, to a service identifier 16B corresponds a list LB of addresses of the B-subscribers; the MSIsdn numbers, or addresses, of the members of this group LB being B1, B2, ..., BN. On the basis of the service identifier 16 the group processor 13 searches for the group of B-subscribers corresponding to the service identifier 16A, e.g. the list LA, and searches for each MSIsdn number A1, A2, ..., AN contained in the list LA in turn. Simultaneously, the group processor 13 copies the original short message as many times as there are addresses in the list LA, and places in turn each MSIsdn address of a B-subscriber contained in the list LA in the TS-

Destination-Address field DA of the copied message, the DA containing the address of the recipient of the short message. Subsequently the group processor 13 sends each of the copied short messages to their processors 2A. The operation of the processor is described in greater detail in connection with the description of the prior art solution in Fig. 2. The processor forwards the thus formed short messages, which are identical except for the address of the B-subscriber, to receiving B-subscribers.

The drawings and the description thereof are only to be understood as illustrating the idea of the invention. In their details, the claimed method, mobile exchange and system for transmitting short messages in a cellular radio system may vary within the scope of the claims. Although the invention is described above primarily in the mobile telephone system GSM, the claimed method, mobile exchange and forwarding system may also be used in some other kind of radio telephone system or in some other telecommunication system.

Claims

1. A method for transmitting short messages in a cellular radio system, in which method a short message is received by a mobile exchange (GMSC) of a cellular radio system, c h a r a c t e r i s e d by
- checking (12) whether the received short message is to be delivered to one subscriber or to a group (LA, LB, LC) of several subscribers;
 - searching (Fig. 5) for the subscriber numbers (A1, ..., AN; or B1, ..., BN; or C1, ..., CN) of all the subscribers of the group on the basis of the service identifier (15) contained in the short message to be delivered to the group;
 - copying (13) said short message for each subscriber of the group; and
 - sending (2A) the copied short messages to the subscribers.
2. The method of claim 1, c h a r a c t e r i s e d in that for each copied short message a separate transmission process (2A) is initiated to forward the copied short message to the subscribers.
3. The method of claim 2, c h a r a c t e r i s e d in that the separate transmission process (2A) initiated comprises the steps of
- checking the home location register of the recipient of the short message;
 - checking the routing information for the short message to find out the location of the receiving subscriber;
 - checking the location of the mobile exchange in the location area of the subscriber;
 - forwarding the short message to the mobile exchange in the location area of the subscriber.

4. A mobile exchange (MSC) for transmitting short messages in a cellular radio system, comprising

- means (1A) for receiving an incoming short message;

5 - means (3A) for checking where the recipient of the short message is located; and

- means (2A) for forwarding the received short message to a subscriber,

characterised in that the mobile exchange (MSC) further comprises

10 - means (12) for analyzing the service identifier (15) of the received short message to check whether the short message is to be delivered to one subscriber or to a group (LA, LB, LB) of several subscribers,

15 - memory means (17) for storing the addresses (A1, ..., AN; B1, ..., BN; C1, ..., CN) of the subscribers included in the subscriber groups (LA, LB, LC) corresponding to the service identifiers (15) of the received short messages;

20 - means for reading from the memory means (17) the addresses (A1, ..., AN; B1, ..., BN; C1, ..., CN) of the subscribers of the group to which the short message is to be delivered on the basis of the service identifier (15) contained in the short message;

25 - means (13) for copying the short message directed to a group for each member of the group; and

- means (2A) for forwarding each of these copied short messages to individual subscribers.

30 5. A mobile exchange of claim 4, characterised by comprising

- a short message processor (1A) for receiving an incoming (1) short message;

- a short message preprocessor (11) responsive to the processor (1A);

- memory means (17) for storing service identifiers (15) of short messages, corresponding identifiers (16), and subscriber numbers (A1, ..., AN; B1, ..., BN; C1, ..., CN) of the subscribers included in the corresponding groups (LA, LB, LC) of subscribers;

- means (13) responsive to the preprocessor (11) for receiving a short message directed to a group (LA, LB, LC) of subscribers to read from the memory means (17) the addresses (A1, ..., AN; B1, ..., BN; C1, ..., CN) of the subscribers of the group on the basis of the service identifier (15) included in the short message, to copy the original short message directed to a group for each member of the group, and to forward the short message to different short message processors (2A) for transmission to individual subscribers.

6. A mobile exchange of claim 4, characterized in that the mobile exchange (MSC) is a gateway MSC (GMSC).

7. A mobile exchange of claim 4, characterized in that the means for analyzing the service identifier (15) of a received short message analyze the characters of the service identifier (15) of the short message to check whether the short message is to be delivered to one subscriber or a group of several subscribers.

8. A system for forwarding short messages, comprising a short message service centre (SC) for forwarding short messages transmitted by an A-subscriber to a mobile exchange (MSC) of a cellular radio network, the mobile exchange (MSC) comprising means for transmitting short messages, characterized in that the mobile exchange further comprises

- means (12) for analyzing the service identifier (15) of the received short message to check whether

the short message is to be delivered to one subscriber or to a group (LA, LB, LC) of several subscribers,

- memory means (17) for storing the addresses (A1, ..., AN; B1, ..., BN; C1, ..., CN) of the subscribers included in the subscriber groups (LA, LB, LC) corresponding to the service identifiers (15) of the received short messages;

- means for reading from the memory means (17) the addresses (A1, ..., AN; B1, ..., BN; C1, ..., CN) of the subscribers of the group to which the short message is to be delivered on the basis of the service identifier (15) contained in the short message;

- means (13) for copying the short message directed to a group for each member of the group; and

- means (2A) for forwarding each of these copied short messages to individual subscribers.

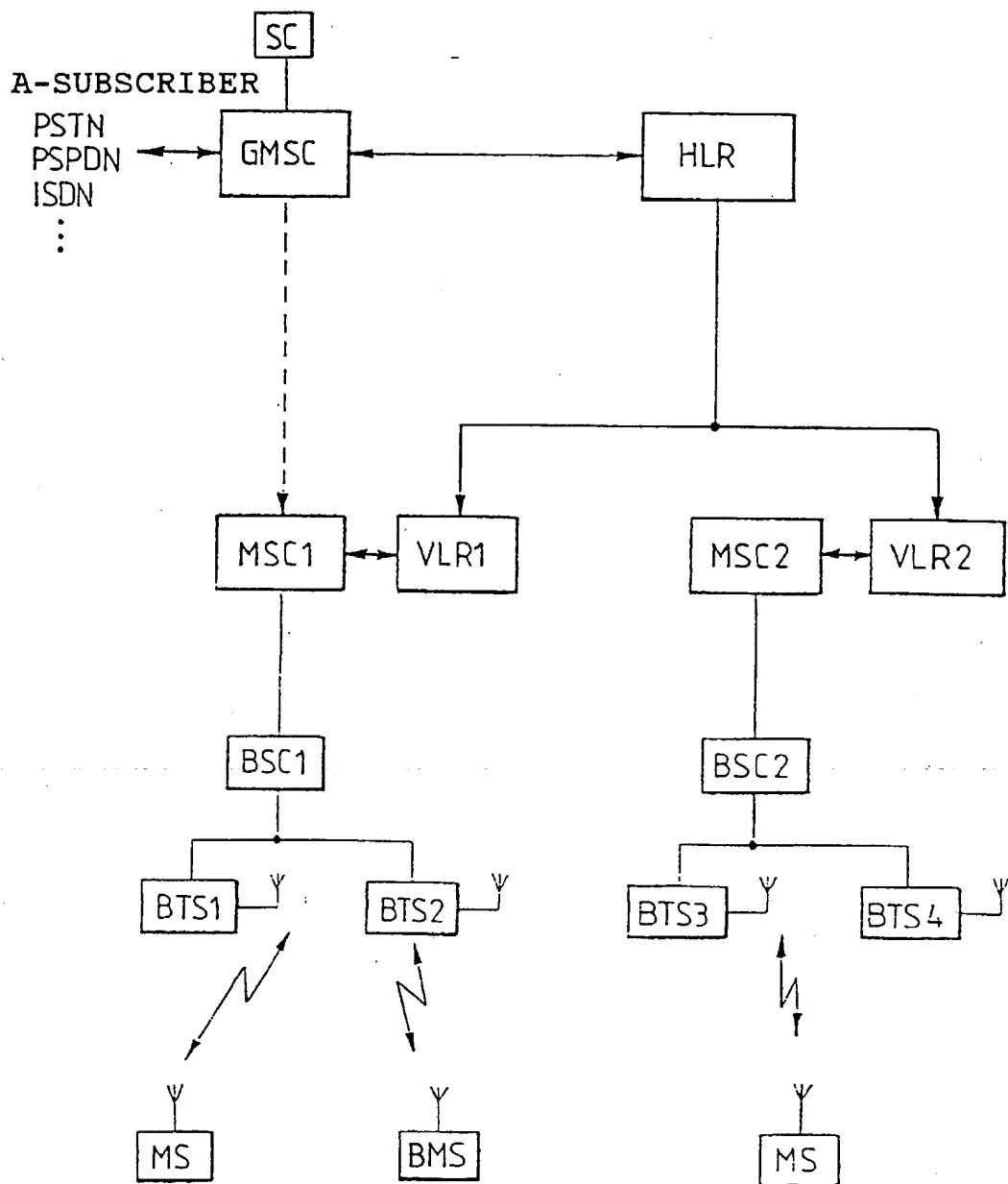


FIG. 1

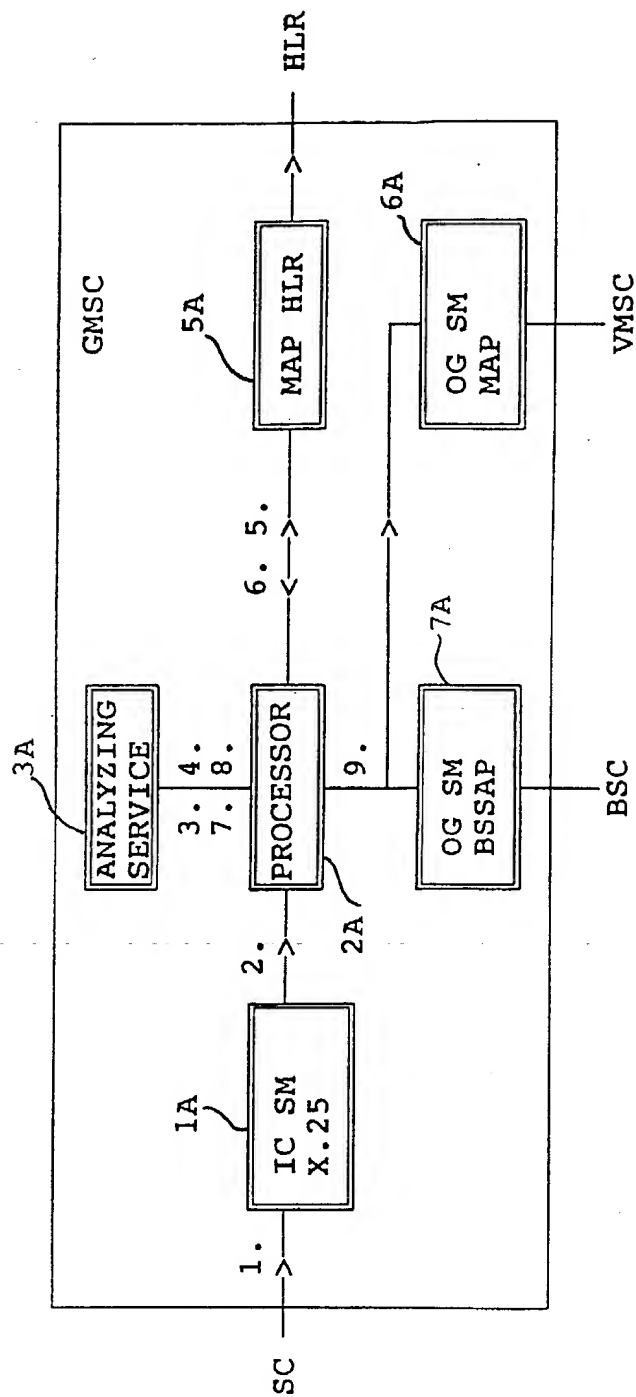


FIG. 2

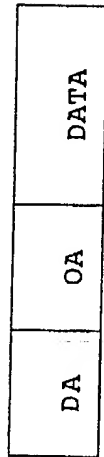


FIG. 3

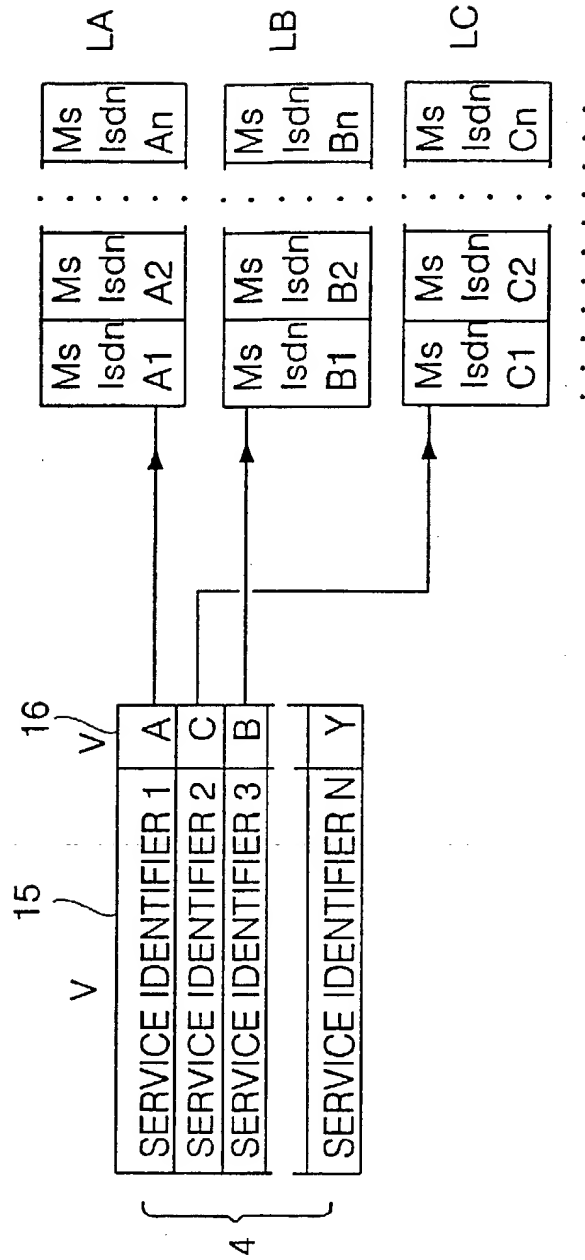


FIG. 5

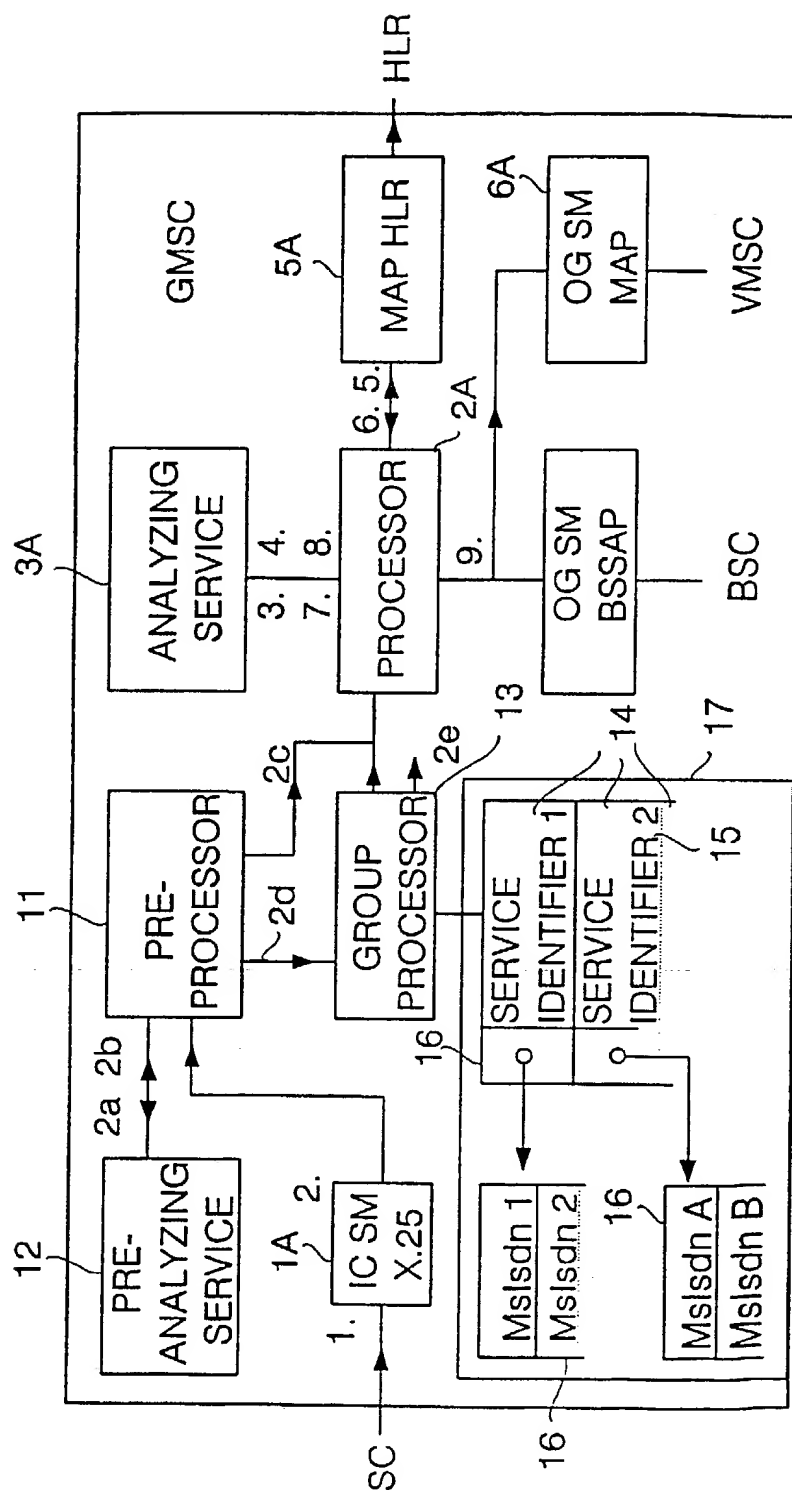


FIG.4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 93/00419

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: H04Q 7/04, H04M 3/42, H04L 12/58

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: H04B, H04L, H04M, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

ORBIT: INSPEC, JAPIO, WPAT

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Recommendation GSM 03.40, "Technical Realization of the Short Message Service - Point-to-Point", version 3.5.0, European Telecommunications Standards Institute, ETSI/PT 12, February 1992; see page 10 (chapter 3) - page 20 (chapter 5), page 32 (paragraph 9.2.3) - page 36 (paragraph 9.2.4.13)	1-8
	--	
Y	Andrew S. Tanenbaum, "Computer Networks", 2nd ed., Prentice-Hall, Inc., 1989, ISBN 0-13-166836-6, pp. 546-551; see especially page 548, lines 21-24	1-8
	--	

☒ Further documents are listed in the continuation of Box C.☐ See patent family annex.

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Date of the actual completion of the international search

4 February 1994

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 93/00419

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	Research Disclosure, September 1991 Number 329, Kenneth Mason Publications Ltd, England; see page 642, item 32902: "Specific Recipient Status Within Distribution List". -----	1-8